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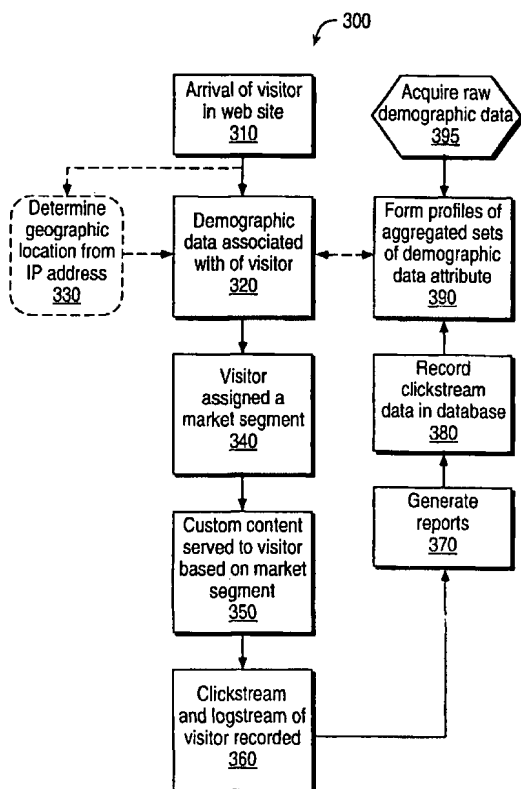
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(54) Title: ELECTRONIC COMMERCE SERVICES



(57) Abstract: Custom content is provided to the visitor of a web-site by assigning a market segment (340) to the visitor and delivering content based upon the market segment (350). The market segment is selected based upon demographic data associated with the visitor (320). In a preferred embodiment, cookie data from multiple vendors is aggregated to form a database for forming visitor profiles of a substantial fraction of potential visitors. A default market segment is preferably reserved for visitors for whom limited demographic data is available. The demographic data may also include geographic data associated with the visitor's IP address (330). In one embodiment, click stream data, such as purchase instance data, is recorded (360) along with the visitor's profile, thereby forming an augmented profile for later analysis of conversion rates and consumer behavior. In a preferred embodiment the market segment is determined by a central service site and communicated to the client servers that then serve the custom content via HTTP commands.



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ELECTRONIC COMMERCE SERVICES

RELATED APPLICATIONS BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to an on-line e-commerce system, and more particularly, to an electronic commerce service for providing custom content to the visitor of a web-site.

2. Description Of Background Art

Electronic commerce, also known as "e-commerce" is a form of commerce that utilizes the World Wide Web (WWW) to market goods to consumers and businesses. An e-commerce web-site may contain a wide variety of information on the goods that are offered for sale via the web-site. This information may be in the form of text, pictures, interactive demonstrations, and audio messages. Recently, the technology to provide video-files, so-called "streaming media," permits a web-site to include video messages. Many e-commerce sites offer for sale a wide variety of different types, styles, and models of goods. Consequently, an e-commerce web-site also typically includes a significant number of web pages, each of which is often packed with descriptions of the different products or pages containing links to the products. An e-commerce site may also provide other types of information used by consumers to make buying decisions, such as information on warranties, shipment, or customer support.

E-commerce web-sites may use a variety of techniques to customize the shopping experience for repeat visitors to the site. As shown in FIG. 1, when a repeat visitor logs onto an e-commerce site 110 the web-site may examine a data log of the visitor's previous visits 120. The data log may include a summary of which pages of the web-site that the visitor previously viewed, what items they purchased on previous visits, or registration data voluntarily supplied by the visitor on previous visits. The site then provides customized content to the repeat visitor 130 directed towards the visitor's interests. For example, if the visitor previously bought women's clothes via the web-site, the web-site may serve web pages having a large fraction of women's clothing in

the home-page of the web-site. As another example, if the visitor previously bought luxury goods, the web-site may serve web pages to the visitor that have a large fraction of luxury goods on the home page.

Unfortunately there has been heretofore no satisfactory solution to providing compelling content to first time visitors. Designing an e-commerce web site that appeals to a wide cross-section of first-time visitors poses several special marketing problems for an e-commerce company. It is difficult to design a single web site that fulfills all of the needs of the majority of first-time visitors. First, the language, style, format, and graphics of the web-site should be appealing to a broad variety of different potential consumers throughout the world. Second, the site should assist consumers to find items of interest to the user. Some users will leave a site without buying anything if they do not find items of interest in a short length of time. Finally, a web-site preferably helps price-sensitive consumers to locate bargains. Some consumers use an on-line store for the convenience of being able to quickly find and purchase an item without having to go to a conventional store. However, other consumers are price sensitive and use an e-commerce site to attempt to find bargains. It is difficult to design a single home page that adequately addresses these conflicting tastes and preferences in a satisfactory manner.

The fraction of first-time visitors to a web site who make a purchase is often called the "conversion rate" of a web-site. Conversion rates are generally low. Typically less than 5% of first-time visitors to an e-commerce web-site actually make an on-line purchase. The low conversion rates encountered in the e-commerce industry force many e-commerce companies to spend a large fraction of their operating budget on advertising. Consequently, conversion rates are a major concern in the e-commerce industry.

Providing custom content addressed to the needs and interests of first time visitors is likely to increase conversion rates. However, conventional methods for customizing content for first-time visitors have several drawbacks that have prevented their widespread use. As shown in FIG. 2, one prior art approach to customizing content for first time visitors logging into a web site 210 is to request a first-time visitor to fill out a registration card or other profile data 220 when they log onto the site. The registration card that the visitor inputs includes data that can be used to determine the user's preferences. After the visitor submits registration data 230, the site can then

provide customized content to the visitor 240 based upon the registration data. However, requesting a visitor to submit detailed registration data before displaying a custom home page to the visitor imposes a significant burden that may scare away first-time visitors from the web-site without looking at the home page. Consequently, e-commerce sites rarely utilize the registration method shown in FIG. 2, although some e-commerce sites request that a visitor input their geographic location or language preference (e.g., English, French, or Spanish) after the visitor has logged onto the home page of the web-site.

Another variation of the conventional registration approach is to use personally identifiable information (PII) of the visitor in order to lookup consumer profile information (e.g., previous purchasing behavior or credit history) for the visitor from another database. For example, some consumer information services collect data on the purchasing and/or credit history of individual consumers that is potentially accessible if the name, address, phone number or other personally identifiable information of the visitor is known. This approach obviates the need for the visitor to submit detailed registration data. However, this approach has several drawbacks. First, a large percentage of visitors are unwilling to voluntarily submit personally identifiable information prior to entering a web-site. PII can be obtained without the knowledge of the visitor. For example, PII databases can be acquired by collecting PII via cookies from a collection of affiliated web-sites, i.e., by collecting PII every time visitors access one of the affiliated web-sites. However, the e-commerce industry is under increasing pressure to minimize the quantity of PII that it acquires, uses, stores, or distributes downstream to others. Finally, the database of a conventional consumer information service typically has many limitations. For example the databases of conventional consumer information services often contain records corresponding to only a fraction of all potential computer users and the databases are not structured to provide the type of information required to improve conversion rates for e-commerce applications.

What is desired is a new system and method for customizing the content delivered to visitors to a web-site who have not previously purchased goods at the site and which does not require collecting registration data or personally identifiable information.

SUMMARY OF THE INVENTION

Generally speaking, the present invention includes a system and method to permit a demographic market segment to be assigned to the visitor of a web-site even if the visitor has not previously submitted registration information or purchased items at the web-site. The market segment assigned to the visitor can then be used to select a category of custom content to be delivered to the browser of the visitor that is likely to appeal to the visitor, based on the visitor's physical, socio-economic, geographic, behavioral, lifestyle, or other demographic attributes. One embodiment of the present invention includes a capability to record click stream data for the visitor browsing the custom content, which allows calculation of conversion rates in addition to permitting the formation of enhanced profiles of visitors including both demographic data and purchase instance data.

One aspect of the present invention is a method of providing custom content from a web server, the method including the steps of: receiving an identification code residing on the computer of a visitor to a web-site and delivering custom content to the visitor as a function of a demographic profile of the visitor associated with the identification code. Another aspect of the present invention is a method of determining an appropriate market segment including the steps of: forming at least two market segments having different demographic attributes; receiving an identification code residing on the visitor's computer; accessing a database of demographic records to find at least one demographic profile for the identification code; and selecting one of the market segments for the visitor as a function of said at least one demographic profile. In one embodiment, click stream data is recorded as the visitor browses custom content served by a client server as a function of the selected market segment.

Another aspect of the present invention is a system to determine an appropriate market segment for a visitor to a web site of a client server, the system generally comprising: a host server coupled to the client server; a demographic database coupled to the host server, the demographic database including a plurality of demographic profiles, each demographic profile having at least one set of demographic attributes for each identifiable browser in the demographic database; a marketing segment database coupled to the host server storing at least two preselected demographic market segments; and a decision engine coupled to the host server, the decision engine receiving an identification code stored in the visitor's computer and selecting one of the

at least two market segments as a function of the attributes of the visitor's demographic profile. In a preferred embodiment, a visitor's metrics module is used to record click stream data as the visitor browses the custom content served by the client server as a function of the selected market segment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a flow chart of a prior art e-commerce system for providing custom content to a repeat visitor to a web-site.

Figure 2 is a flow chart of a prior art e-commerce system for providing custom content to a visitor who submits a registration form.

Figure 3 is a flow chart showing an embodiment of a method of serving custom content in accordance with the present invention.

Figure 4A is an illustrative diagram of a market segmentation hierarchy in accordance with the present invention.

Figure 4B is a block diagram illustrating how cookie data from multiple sources may be combined to form improved profile data in accordance with the present invention.

Figure 5A is a flow chart showing an embodiment of a method of serving custom content in accordance with the present invention.

Figure 5B is a flow chart showing an embodiment of a method of serving custom content in accordance with the present invention.

Figure 6 is a block diagram illustrating a method of recording click-stream data to form profiles containing both demographic data and click-stream data in accordance with the present invention.

Figure 7 is a block diagram of an apparatus in accordance with the present invention.

Figure 8 is an overview of the components that compose the host web server.

Figure 9 is a diagram of a preferred apparatus in accordance with the present invention.

Figure 10 is an illustration showing an embodiment having offline data processing in accordance with the present invention.

Figure 11 is an illustrative diagram of a hierarchy of a test and control system for optimizing market segment models and content in accordance with the present invention.

Figure 12A is an illustration of the message flows between the sites when a profile vendor server is used.

Figure 12B is an illustration of the message flows between the sites when a profile vendor server is not used.

The figures depict preferred embodiments of the present invention for purposes of illustration only. One of skill in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods disclosed herein may be employed without departing from the principles of the claimed invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

FIG. 3 is a block diagram illustrating an embodiment 300 of the method of the present invention that facilitates providing custom content to a visitor to a web-site without requiring personally identifiable information or registration data. As shown in FIG. 3, a visitor (such as a first-time visitor) accesses a web-site 310, such as by entering the generic Uniform Resource Locator (URL) of the site in their browser. A demographic data profile is associated with a visitor 320. As described below in more detail, in preferred embodiments the demographic data profile is a profile having an aggregated set of data attributes 390 from a plurality of sources 395 of demographic data. The demographic profile may also include the geographic location 330 of the visitor.

The term “demographic data” has the common definition in the business world as the characteristics of human populations and population segments used to identify consumer markets. The common definition of demographic data typically includes physical and socio-economic attributes of individuals, such as age, gender, household income, and educational level. However, as used in this application demographic data may also include the geographic location of the visitor. Additionally, as used in this application demographic data may also include behavioral and lifestyle attributes, such as an individual’s interest in specific hobbies or activities, such as sports or clothes.

In a preferred embodiment the demographic profile associated with the visitor is based upon the Internet Protocol (IP) address of the visitor and cookie profile data obtained from a plurality of commercial vendors having specific cookie identification

(ID) files residing on the visitor's computer. The IP address is the network address of an Internet Service Provider (ISP) to which data is delivered to the user during an Internet session. As described below in more detail, some types of geographic data may be inferred from the IP address of the user. Many ISPs reuse the same IP address for subsequent users, i.e., an IP address defines a unique computer user only during the user's Internet session. Consequently, in the preferred embodiment cookie identification (ID) data residing on the visitor's computer is read to uniquely identify (ID) a visitor so that demographic profile data from a plurality of commercial vendors may be associated with the visitor to form an improved set of demographic attributes for the visitor.

The visitor is then assigned a market segment 340. There are at least two market segments. One or more default market segments are also preferably included for those visitors for whom only limited demographic data is available. As used in this application, a market segment is a demographic segment believed to have similar tastes, preferences, interests, or lifestyle such that individuals in the market segment have a propensity to have similar opinions and tend to make similar decisions regarding content displayed on a web-site. Illustrative examples of variables useful for forming an e-commerce market segment are the estimated age, gender, income, marital status, children living at home, education, geographic location (e.g., Far West, Northeast, Midwest, or Deep South), and behavioral and lifestyle attributes of the first-time visitor.

The market segments are selected to correspond to likely patterns of consumer interests or behavior. For example, in the clothing industry it is known that tastes and preferences for clothing tend to follow strong age preferences. Additionally, consumer purchasing decisions for clothing also tend to strongly depend upon income, marital status, and gender. Additionally, as used in this application a market segment may include attributes of the visitor's browser type and line speed, since these attributes may correlate with other demographic variables such as the expectations and tastes of a demographic segment for the manner in which content is delivered. For example, it may be relevant in forming a market segment for teenagers that the visitor has a broadband connection, since this permits high quality streaming video to be served on a home page and because high quality streaming video may appeal to the market segment composed of teenagers.

A variety of different approaches can be used in regards to determining how to select appropriate market segments for a visitor as a function of the set of demographic attributes of the profile of the visitor. As one example, a pre-computed segmentation model may be implemented as a simple lookup of a demographic vendor cookie value. This model requires a single database table containing two columns, the demographic attributes for the cookie value associated with the visitor and the segmentation decision. Another model is based upon a rule set. In a preferred embodiment, the rule-based model defines a segmentation that is both complete and unique (each user satisfies one and only one rule). The database table contains one row for each rule and the select statement fetches the row corresponding to the user properties. For example, a rule set of {if sex=M then decision=A; if sex=F then decision=B; if sex=? then decision=A} could be implemented with a table T(sex, decision) with rows {{M,A}, {F,B}, {? ,A}} and with select statement "select decision from T where sex = ?". Still another model type utilizes a decision tree. The decision tree model defines a decision tree that is executed online to make a decision. Each node in the tree is an expression that evaluates to N possible values; a node with N possible values has N children. Each child is either another node or a leaf. A leaf specifies a decision. It will be understood that is all of these models that geographic data associated with the IP address of the visitor may be used as an additional variable.

The market segment may be used to determine a demographic audience for providing custom content. The market segment may be output as a separate output signal but is preferably used as part of a larger system for providing custom content to a visitor based upon the demographic attributes of the visitor. FIG. 4A is a diagram of an illustrative of a market segmentation hierarchy for a clothing site. As can be seen in FIG. 4A, a small number of demographic variables permits many different market segments to be selected. In this illustrative example, the market segments are based upon observations that women tend to be interested in different clothes than men and that marital status and income also influence tastes, preferences, and interests. In this illustrative example, the visitors are divided into ten market segments, including market segments for which one or more attributes, such as age, is unknown. The market segments may be derived from analysis of the consumer buying patterns in related industries or they may be based upon the experience and intuition of industry experts. Additionally, the market segments may be empirically varied to assess their efficacy.

Referring back again to FIG. 3, custom content is served 350 to a first time visitor based upon the market segment assigned to the visitor, e.g., each market segment may be shown a different home page that displays different goods or which presents the goods in a different manner. The custom content served to each market segment may be regularly or dynamically updated to take into account bargain offers, seasonal specials, and new product offerings. Any known method to customize content for an intended demographic audience may be used, such as test market studies and market psychology analysis. For examples, an on-line shoe store may show test content of several different home pages to a test audience in order to determine the content to be delivered to different market segments.

In a preferred embodiment the click-stream data of the visitor is then recorded 360 in a database. The click-stream data for an e-commerce site preferably includes purchase instance data, i.e., a decision to make a purchase, since this allows conversion rates to be calculated for first time visitors. As described below in more detail, the click-stream and purchase instance data of a first time visitor assists in forming relevant market segments and in determining the content best suited for a particular market segment. In a preferred embodiment reports are generated 370 from the click-stream data for each market segment to provide empirical data on the conversion rate of each market segment. The purchase instance and click-stream data are preferably recorded 380 in database 390 for future analysis.

First time visitors who for which a profile 390 cannot be formed from raw demographic data 395 are assigned a default value. In one embodiment, the default values are the same for all geographic regions. In another embodiment, the default value is particular to a given geographic region such that geographic data 330 is used to determine the default content served to the first-time visitor to the web-site.

The demographic profiles 390 are preferably formed by acquiring raw demographic data profiles from at least two available suppliers of demographic data 395. This permits the profiles that are formed to potentially include a set of aggregated demographic data attributes. Techniques to select a set of data attributes for a visitor from two or more sources of profile data are described below in more detail. Each supplier of raw demographic data potentially has a database entry containing demographic profile data (commonly known as "cookie data") for the visitor indexed by a cookie ID code residing on the visitor's computer. This data may be acquired from a

vendor as a set of demographic attributes or, in some cases, as a demographic profile key (e.g., one or more codes that may be used to lookup the demographic attributes in a table of attributes). As shown in FIG. 4B and as described below in more detail, in a preferred embodiment the cookie data of multiple vendors is preferably used because it facilitates obtaining high quality demographic profile data for a large number of Internet users. A profile formed by analyzing the cookie data for a visitor is preferably stored in database 390 along with geographic data 330 and click-stream data 380 for each visitor who logs onto the site. A persistent cookie may also be written in the visitor's computer to facilitate identifying the visitor and accessing profile data collected for the visitor. The profile of each visitor is preferably cached in case the visitor returns to the site, thus reducing or eliminating the need to look up cookie data in subsequent visits to the same site or an affiliated site.

Commercially available sources of raw demographic data profiles vary widely in content and quality. Many commercially available sources of raw data include age, gender, and (in some cases) approximate income bracket. Other sources are more detailed. For example, some Internet service providers, such as IWON.com, require members to fill out registration questionnaires. This so-called "deep data" may include profiles having a wide variety of demographic data attributes for a significant number of computers. Some data sources also have profiles that include lifestyle attributes, such as interests in sports, cars, or travel. Consequently, the inventors of the present application have recognized that it is desirable to be to combine several available sources of demographic data to obtain a superset having greater coverage and more potential demographic data for an individual visitor than a single source. This capability is particularly important for e-commerce sites in which the tastes, preferences, and behavior of potential consumers is a rapidly varying function of one or more demographic attributes such that detailed demographic information is required to form meaningful market segments.

Table 1 is an illustrative table of some of the major providers of demographic data showing the inventors' rough estimates of the approximate number of demographic profiles in each source. There are presently estimated to be over 100 million users of the Internet. As can be seen in Table 1, no single source of raw demographic data covers all of the users of the Internet. Note that the largest vendors have records for less than about 60% of all Internet users. In order to be able to acquire demographic data for

greater than about 60% of all possible Internet visitors data from several vendors must be combined.

Source Of Raw Demographic Data	Approximate Number Of Cookies, June 2000
24 x 7 Media	30 million
Alladvantage	4 Million
DoubleClick	40 million
Engage	50 million
Juno	3 million
Matchlogic/Excite	60 million
NetZero	4 million
Naviant	3 million

TABLE 1. Estimated number of data records from various commercial vendors.

Data depth is another problem with many commercially available sources of profile data. The largest vendors (in terms of numbers of cookies) typically provide the least amount of demographic information for each computer user having a cookie ID listed in their index. Unfortunately, detailed demographic information, such as detailed age or income estimates, may be required in some cases in order to be able to form effective market segments. For this case, data from several different sources is preferably combined to form a "super profile" for individual computer users by combining the data of different commercial vendors into one set of data attributes. The data records of many of the major providers overlap, i.e., have entries for the same user. Statistical methods are preferably implemented in a computer program to merge the attributes of the cookie data profiles of multiple data vendors into a superset. For example, suppose that there are a total of M different data sources and some of the attributes appear in a subset of the data sources, i.e., $D'=[D_1, D_2, \dots D_m]$. For each attribute, j , appearing in the databases of D' , a combining function may be developed having the form $f(D_{1,j}; D_{2,j}; \dots D_{m,j})$ where $D_{i,j}$ is the value of attribute j in database i . Illustrative examples of combining functions include taking the value of the attribute with the highest confidence value, using a linear weighting function, or using a complex non-linear mapping function, such as one learned by a neural network. The most useful

attributes can be determined using cross-correlation methods, such as by measuring the cross-correlation between attributes using conventional methods such as the standard linear correlation coefficient for numerical attributes or the chi-square measure for discrete-valued attributes.

In addition to a statistical merging process, a rule-based search of the cookie data from different vendors can be performed to form a set demographic attributes required to form a market segment for a visitor. For example, a first set of rules may be used to determine the order in which to look up cookie profile data from different data sources and a second set of rules may be used to determine how to make a decision regarding selecting data attributes from the different cookie profiles. For example, a primary data source may be selected based upon its high coverage. Secondary data sources may comprise data sources having a lower coverage or different degrees of demographic information. A first set of rules may, for example, be to search the primary data source and to use it if the visitor is listed in the primary database, with the secondary sources being searched for demographic attributes of interest according to an ordered ranking (e.g., highest coverage to lowest coverage) only if the data attribute is not found within previously searched vendor sources within a pre-defined range or confidence interval. The second set of rules may also include searching multiple secondary sources, if necessary, to find at least one source having a data attribute range (e.g., age range) within a pre-selected range. Additionally, the second set of rules may include limits on the total number of cookie sources searched before assigning a default value to a demographic attribute or may include a default rule, such as selecting the cookie source having data attributes closest to market segment ranges if no other cookie data can be found for the visitor. This approach has the advantage that it potentially the time spent searching and analyzing cookie data. For example if a single large source of cookie data (e.g., EXCITE) has sufficient demographic data available to assign a user a market segment there is no need to search for other cookies. However, if the visitor is not listed in the largest source(s) of cookie data or if the largest source(s) have insufficient data then the cookie data of other vendors may be analyzed and/or combined to form the data required to assign the visitor a market segment.

FIG. 4B is a block diagram illustrating how data from two or more different profiles 405, 410, 415 may be aggregated to form a single data set 420 for a visitor. In the illustrative example of FIG. 4, profile data on the age, income, and gender from

three different sources 405, 410, 415 for a visitor is read using the cookie files on the visitor's computer. The data is statistically combined to form a single data set having greater detail than any one single source. This permits a data set 420 with greater demographic detail than any one of its sources. Thus, data set 420 has improved depth compared to a single data source 405, 410, 415. For example, the improved depth of data set 420 facilitates forming demographic market segments with comparatively narrow ranges of ages and incomes that correspond to consumer tastes, preferences, and interests for the goods sold by a particular e-commerce site.

While a single e-commerce site could practice the method of the present invention, there are significant economies of scale for a service provider to form demographic profiles 390 from a plurality of raw data sources 395. In preferred embodiments, shown in FIGS. 5A and 5B, a central service site is used to assign an appropriate market segment to a visitor visiting any e-commerce site. The embodiments shown in FIGS. 5A and 5B are similar except that the embodiment of FIG. 5A uses a market segment code to define a re-direct path back to the client server whereas the embodiment of FIG. 5B communicates a market segment code to the web server of the client via a server-server interaction in order to provide custom content. As shown in FIG. 5A, when a first time visitor logs onto a client web site 510, they are redirected to a service site 520. As described below in more detail, the redirection is preferably performed using a hypertext transfer protocol (HTTP) command path link.

After the initial request of the visitor is redirected to the service site, the service site associates demographic data with the visitor 530. This may include any cookie data that can be acquired by reading one or more cookie IDs previously stored on the visitor's computer and data that can be acquired by analyzing the IP address of the visitor. Additionally, any known method for determining the browser type and line speed may also be employed, since in some cases it is desirable to have capability to select content based upon the browser type and line speed of the visitor.

The service site uses a decision engine to assign the visitor a market segment 540 based upon the demographic profile of the visitor. Each client site serviced by the central service site is likely to have its own market segmentation model. Consequently, the central service site is preferably configured to determine the URL of the client site in order to assign a market segment appropriate for the particular client site. Techniques to determine the URL of a site originating a re-direct request are well-known in the art,

with a preferred technique including passing a parameter indicative of the URL of the client site. The market segment of the visitor is then communicated to the client server, which in one embodiment is achieved by passing a parameter indicating the segment to be served. As illustrated in the embodiment of FIG. 5A, a market segment code defines a re-direct path back to the client server, as shown in step 550-A. In a preferred embodiment this is through a second HTTP command link forming a path link to one of a plurality of web page files within the client server, with the path link including a market segment code parameter for defining the re-direct path back to the market-specific web-page content in client server. In the embodiment of FIG. 5B, the market segment of the visitor is communicated to the client server as shown in step 550-B. The client server of the client web site then delivers custom content to the first time visitor 560 in accord with the assigned market segment. Click-stream data for the visitor is then preferably communicated back to the service site 570 for storage in the database of the service site. A cookie may also be recorded on the visitor's computer to facilitate recognizing the visitor in subsequent visits to the client web-site or other web-sites linked to the service site.

One advantage of a central service site 520 is that the cost of forming a high quality aggregated database of demographic data from a variety of sources is spread out over multiple client sites. Additionally, as indicated in FIG. 6, another benefit of a single service site is that it may store click-stream and purchase instance data for a large number of client sites. For example, the click-stream data from a clothing site, a booksite, and a sportsite may be stored in the database of a service site, as shown in FIG. 6. As an illustrative example, suppose that a woman in the age range of 18-30 years old with an income of \$31,000 to \$40,000 visited a sports site, a clothes site, and a book site. The click-stream data for the events may be recorded as part of a single profile in the database of the service site. Consequently, the general interests of individual visitor may be determined even if the visitor makes only a small number of purchases at each separate e-commerce site. This enhanced profile data may then be used as a source of information to customize content when the woman visits any site coupled to the service site. Additionally, the database of enhanced data profiles may be analyzed to refine market segment models for a particular e-commerce site. For example, the database of enhanced profiles can be used to find correlations in the

interests of various market segments, to refine market segments, or to assist in customizing content for market segments.

FIG. 7 is a block diagram of a preferred embodiment 700 of an apparatus for performing the method of the present invention. A client web server 720 hosts an e-commerce site (not shown in FIG. 7). The visitor inserts the URL of the client web site in their web browser 705 and a conventional Internet data link 732 (e.g., a link made by a HTTP command path link) is made between browser 705 and client web server 720. The client web server 720 re-directs the initial request to the host web server 730 via a second data link 735, such as a link made by a HTTP redirect command path link. At least one cookie ID (e.g., data key) is received (read) from the user's browser 705 and is used to look up demographic and geographic information at the host web server 730 via the profile server 740. As shown in FIG. 7, in a preferred embodiment, a third data link 738, preferably also a HTTP command path link, is used to access the profile server 740 from browser 705. The profile server 740 may access one or more different sources of raw demographic data stored in the databases of commercial vendors via a network connection. Alternately, the profile server 740 may access an off-line database of demographic profiles. As described below in more detail, additional data path links (not shown in FIG. 7) permit information to be coupled from the profile server 740 to the decision engine (not shown in FIG. 7) of the host web server 730 for determining an appropriate market segment.

FIG. 8 is a detailed functional block diagram of a preferred embodiment 800 of an apparatus to practice the method of the present invention. The host web server includes a decision engine 805, a visitor metrics module 810, an event log module 815, a user logger module 820, an event logger module 825, a web server 830, a heartbeat daemon 835, a marketing profile database 845 and a customer profile database 850. It will be understood that the customer profile database 850 may be coupled to the profile server 740 for serving the profiles as required or to obtain profiles not already in profile database 850. The elements shown in FIG. 8 can be divided for the purposes of discussion into a front-end web server 860, a backend server 865, and an offline storage section 870. A host web server 860 may host visitors from multiple sites and experience bursts of high traffic. Consequently, the apparatus is preferably implemented using load balancing and fault tolerant techniques. A preferred fault tolerant apparatus include a fault-tolerant redundant architecture for both the front end 860 and backend 865.

Referring again to the preferred embodiment of FIG. 8, the user links their computer to the web-site 890 of client web server 720. The user's computer is redirected to the host web server 830, preferably via a HTTP redirect command path link 895. Cookie ID data is read from the user's computer, as indicated by link 895. The host web server accesses demographic and geographic information stored in the customer profile database 845 or obtained as required via a profile server 740 so that a decision on the appropriate marketing segment stored in the marketing segments module 845 made by decision engine 805. In a preferred embodiment described below in more detail, the market segment assigned to the visitor by decision engine 805 is converted into a market segment code used to define a re-direct path back to the client server.

The user logger 820 accepts logging requests and records user metrics in the storage module 870. The user logger also can consolidate the user metric data. The event logger writes information, warning, error, and fatal events to an event log within the storage module. In response to fatal events, the event logger 825 can trigger alerts to warn an operator. The heartbeat daemon 835 periodically polls processes for status information and raises error events when a process doesn't respond or crosses error thresholds.

FIG. 8 also shows a segment ID server (SegID) 840 as an optional element (shown in phantom as an optional element) used in an alternate embodiment. Segment ID server 840 is coupled to the host web server 830 and serves a market segment ID code to client web server 720, preferably via a server-server interaction 842. The segment ID server 840 shown in FIG. 8 retrieves market segment ID codes preferably stored in a portion of storage element 870 (not shown in FIG. 8). For example, if there are a total of ten market segments for web site 890 the market segment ID codes may be 1, 2, 3, . . . 10. Communication between the client web server 720 and the segment ID server 840 typically occurs only during a segment ID serving interaction. It will also be understood that the market segment codes may be a separate output 844 of segment ID server 840 that is used for applications besides the customization of web-page content. For example output 844 of segment ID server 840 may be stored for analysis of the demographic characteristics of visitors to a web-site. Such information may be useful, for example, in making decisions about the types of goods and services to be offered by an e-commerce site. It will also be understood by those of ordinary skill in the art that

the market segment code served by segment ID server 840 may also be used by an advertising service to assign market-specific advertising banners to a web-site.

The decision engine 805 converts the user metric/click-stream data into user profile information. The demographic profiles 850 is preferably implemented as one or more tables of potential user profiles accessible by a profile server. In the preferred embodiment the decision engine 805 determines the appropriate market segment based upon analyzing a request received from the user's web browser and comparing the information embedded within that request with demographic profiles 850 which are stored within the storage module. Additionally, the approximate geographic location of the user may also be determined from the internet protocol address of the visitor. In a preferred embodiment this is implemented by having a look-up table of IP addresses and their approximate geographic location. Although precise (i.e., street) locations cannot be determined from the IP addresses of most ISPs, the inventors have recognized that the general geographic location (e.g., Northeast, Midwest, Southwest, Far West, East Coast) of an IP address can be determined via a lookup table. IP addresses may also be used to determine visitor location down to the metro level, although the statistical confidence level tends to degrade if the visitor's location must be determined within a metro-region. However, routing technology now permits the path of data packets to be determined with a high confidence within sub-metro regions. Consequently, an e-commerce site employing the present invention can customize content appropriate for the metro area of the visitor. As one illustrative example, the present invention permits first-time visitors to an on-line clothing shop to be served a home page having merchandize related to the local home-teams of the visitor, such as baseball caps of the local baseball team.

The visitor metrics module 810 is used to record information about visitors. This information may comprise "click-stream" maintained by the host web server 860. Such information may include a timestamp, host web server cookies ID, a profile server cookie ID, a referral URL web site, a name of the URL on the host web server web site, a flag denoting whether a market segment decision was made based on the profile server cookie ID or extra information from the decision engine that was used in a feedback loop. Geographic profiles (not shown) may be recorded by visitor metrics 810. In a preferred embodiment a single pixel in Graphics Interchange Format (GIF) file format may be included in the delivered content to determine if a user has purchased something

during their visit to the web-pages served by the client web server. However, it will be understood that other techniques to record a purchase instance may also be used, such as techniques based upon re-direct commands.

FIG. 9 shows a preferred implementation of the apparatus of FIG. 8. As shown in FIG. 9, in a preferred embodiment the communication link between the front end 860 web server system and the backend 865 server system is accomplished by an enterprise application integration platform software package, such as TIBCO/RENDEZVOUS™ by Tibco Software of Palo Alto, California. A preferred front end includes a TIBCO CLIENT™, TIBCO DAEMON™, NETSCAPE IPLANET™, and JAVA SERVLET™, and is coupled to the back end. A preferred back end includes a TIBCO DAEMON™, TIBCO CLIENT™, and ORACLE™ database. This preferred enterprise application integration platform software packet not only facilitates the communication between the web server system and the backend server system, but also load balances requests to the backend server system to evenly distribute the requests from the web server system across the plurality of computers operating within the backend server system. The enterprise application integration platform software also provides fail-over that ensures that if one of the plurality of computers of the backend server fails, requests will be routed to the remaining computers of the backend server.

FIG. 10 is a flowchart illustrating how the apparatus of the present invention allows profile data to be augmented by visitor log data (e.g., click stream and purchasing data) and by geographic data. One benefit of the present invention is the profile augmentation 1010 that is possible by combining raw profile data, geographic data, and clickstream feedback data from a visitor's log 1020. This permits market segmentation behavior models to be refined 1030 or new models 1040 to be developed. Additionally, the data from multiple visitors may be aggregated 1050. A database schema can then be prepared 1060, coupled to a database loader 1070, and connected to a report database 1085 to generate system reports 1080 and custom reports 1090 specific to a particular client site. The custom reports 1090 may, for example, contain conversion rates for first time visitors for each pre-selected market segment. This may be used to revise market segmentation models 1095 used by the e-commerce site.

FIG. 11 is a diagram of an illustrative test and control hierarchy for improving market segment models and improving content for each market segment. In the illustrative example, the visitors are divided according to the ISP domain name

extension. Visitors from universities having a .edu browser extension form a first class of visitors 1105. Visitors from browsers connected to non-educational ISPs form a second class of visitors 1150. A small fraction (e.g., 1-5%) of each class is preferably assigned to a control group and served a baseline content. The control group may be a random sample of all visitors in the class. Alternately, the control group may be further defined into market segments. The use of a control group permits improvements in conversion rates to be measured against a standard. Additionally, note that a market segment, such as segment 3, can have its reaction to various types of content tested by rotating the content delivered to the market segment. This facilitates optimizing content for the market segment. Note also that segment 3 may be a test market segment, i.e., a demographic market for which it is desired to determine if the reaction to content is significantly different than other market segments. The use of test and control techniques facilitates improving market segments and content.

Conventional Internet browsers typically use HTTP commands to form path links to data files in an on-line Web server. For example, when a uniform resource locator is input to a web browser a HTTP command is sent to the corresponding Web server that directs it to fetch and transmit the requested Web page stored in a file of the Web server. The inventors have developed preferred sequences of HTTP command path links (hereinafter command links) for directing the interactions of the visitor's browser, a client server, and a central server site. Two preferred embodiments are shown in the interaction diagrams of Figures 12A and 12B. For the purposes of illustration, the central server site is labeled as "Angara.com". The sequence of arrows illustrate HTTP command path links at different times in a sequence of interactions between the browser of a visitor's computer and the client site, central service site, and a profile server.

FIG. 12A is an illustrative interaction diagram for a site having a profile server coupled to an on-line database of profiles. As shown in step 1, a visitor inputs a first generic uniform resource locator (URL) of a web-site (e.g., "clientsite.com"). The visitor's request is re-directed by the client site to the host web server of the central service site (e.g., lift.Angara.com) as shown in step 2. A URL encoded as a rootpage parameter is also returned that can be used as a basis for future redirection. As shown in step 3, in response to the receipt of the source URL, the profile server retrieves the cookie from the visitor's web browser to act as a key to the profile data held by the

profile server. This URL has all of the parameters of the original request as well as a new "profilekey" parameter that may be used to lookup the demographic profile data. The visitor's web browser requests this new URL and the host web server decodes the "profilekey" parameter to determine a marketing segment and hence the content to be displayed, as shown in step 4. As shown in step 5 the client server responds by returning a web page to the visitor's web browser. As shown in step 6, the visitor may browse the content until they encounter a purchase instance page, i.e., a web-page from which they can make a purchase. Visitor logging relates to using a GIF pixel element or other technique to create a record of a visitor's activities (e.g., a purchase decision) on the e-commerce service site. As shown in step 7, a visitor accesses the URL of the client web server's purchase page. The client web server returns an HTML page containing a host web server embedded image (e.g., a one pixel GIF). The visitor's web browser requests the image from the host web server. The host web server gets the visitor's ID from the cookie. If a cookie isn't present, one is created to be returned. The event is logged and the host web server records purchase instance data. FIG. 12B shows an interaction diagram for an embodiment having an offline profile database residing at the central service site. It is substantially similar except for the omission of the step of accessing an online profile server, i.e., the information for forming a segmentation decision is accessible from the central service site.

While FIGS. 12A and 12B illustrate preferred HTTP redirect interaction for providing custom content from a client server via a host web server, it will be understood that a variety of alternate redirection techniques may be employed which use an assigned market segment to deliver custom content to the visitor based upon using a market segment and HTTP command path links. Examples of alternate implementations include content redirection and content serving. Content redirection relates to the client web server referring a user session to a URL of the host web server. In this embodiment the client web server embeds a URL relating to the profile of the user to the profile server. For example, the client web server can redirect the user using a profile key where the profile server encodes the profile key in a URL and redirects the profile key to the host web server. The host web server then can look-up the profile key in a profile database, which is stored locally within the host web server. Alternatively, the client web server can redirect the user by using profile data where the profile server encodes the profile data in a URL and redirects the profile data to the host web server.

This reference to the host web server will be redirected back to a URL on the client web server where an appropriate marketing segment for a user is located. Content serving refers to the client web server storing one URL for each marketing segment on the host web server. In this embodiment the client web server directly refers to the host web server for the profiling information. In particular, the client web server embeds a URL to the host web server.

One benefit of the method and system of the present invention is that it does not require personally identifiable information (PII) to be acquired, stored, or distributed in order to deliver custom content to first-time visitors. Many commercial sources of demographic data can be purchased stripped of all PII, i.e., containing no individual names, residence addresses, credit card numbers, phone numbers, or e-mail addresses. The one-pixel gifs used to collect purchase instance data are preferably configured to record a decision to purchase an item from the client e-commerce site without collecting additional PII. In a preferred embodiment, no information is collected regarding the exact item purchased, i.e., the purchase instance that is recorded is limited to a yes/no decision made by the visitor to purchase an item from the site. Consequently, in a preferred embodiment the superset of aggregated data demographic data does not collect or store PII. Moreover, in the preferred embodiment using a central service site, the client site is provided (via the redirect) with a market segment ID code (e.g., 1, 2, 3, 4) (or URL containing a market segment code) that contains no PII.

While the method of the present invention is described in detail in regards to the sale of goods on an e-commerce web-site, it will also be understood that the method of the present invention may also be used to provide custom content for web-sites offering services, such as financial planning services. Additionally, the method of the present invention may be applied to media and information sites. For example, some media web-sites make money from banner advertisements. The method of the present invention may be used to create custom media content designed to appeal to first time visitors to a media web-site. For example, a music site could use the present invention to serve content based upon the estimated age, income, or other demographic attributes of visitors to the web-site. As another example, using the method of the present invention a political web-site could serve content based upon the age, income, household status, and geographic location of the visitor.

Additionally, while the method of the present invention has been described in detail in regards to providing custom content for a first time visitor, it will be understood that the demographic data may be combined with purchase instance data to determine an appropriate market segment for a repeat visitor. In particular, it will be understood that an individual e-commerce company may also desire to associate or link an individual's purchasing history to the superset of demographic data 390. This would permit, for example, the market segment assigned to the visitor 340 to be adjusted in light of subsequent purchasing decisions made by the visitor during repeat visits to the e-commerce site.

Moreover, while the present invention has been discussed primarily in regards to using the geographic location of the visitor as an additional demographic attribute, it will be understood that in some cases that determining the geographic location of the visitor may be sufficient by itself to define a market segment. As an illustrative example, if a market is divided into native speakers of English, native speakers of Spanish, and native speakers of French, an e-commerce site located in the United States but seeking orders from individuals in Canada and Mexico may segment the market by language and provide language in the likely native language of the visitor based upon the geographic region in which the IP address of the visitor resides, i.e., provide Spanish content for visitor's residing in Mexico and French content for visitor's residing in Quebec.

The features and advantages described in the specification are not all inclusive and, in particular, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification, and claims. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter.

CLAIMS

What is claimed is:

1. A system for determining a demographic market segment of a visitor to a web-site submitting a uniform resource locator (URL) of the web-site via a web browser residing on the visitor's computer, the system comprising:

- a) a server;
- b) a demographic database coupled to the server, the demographic database including a demographic profile or a demographic profile key for each computer identification code listed in the demographic database;
- c) a marketing segment database coupled to the server storing at least two pre-selected market segments; and
- d) a decision engine coupled to the server, said decision engine receiving at least one identification code residing on the visitor's computer, said decision engine accessing the demographic database to determine a set of demographic attributes for the visitor, said decision engine selecting one of said at least two market segments as a function of said set of demographic attributes of the visitor.

2. The system of Claim 1, wherein said decision engine determines a geographic location of the visitor from the internet protocol address of the visitor and said set of demographic attributes includes the geographic location of the visitor.

3. The system of Claim 1, wherein the demographic database is coupled to the server via a profile server.

4. The system of Claim 1 wherein said market segment is used to determine the content of at least one web-page of the web-site displayed to the visitor.

5. The system of Claim 4 wherein said content includes the option to buy a good or service and the system further comprises:

a visitor metrics module coupled to the server, said visitor metrics module linked to the content displayed to the visitor and recording click stream and purchase instance data.

6. The system of Claim 1, further comprising a second server hosting the web-site and linked to said first server via hypertext transfer protocol (HTTP) command path links whereby an initial HTTP request from the visitor's browser to the web-site is re-directed to the first server and the URL of a subsequent HTTP request

from the visitor's browser to the second server includes a market segment code defining a path to at least one custom web-page stored in the second web-server.

7. A system for providing custom content to a visitor submitting a uniform resource locator (URL) request for a web-site via a browser residing on the visitor's computer, the system comprising:

- a) a first server;
- b) a second server containing a plurality of web-page files corresponding to at least two different files coupled to said second server configured to be accessible by URLs having different path destinations within said second server;
- c) a first hypertext transfer protocol (HTTP) command path link configured to redirect an initial HTTP access request of the visitor from the second server to said first server;
- d) a profile server coupled to the first server for accessing a demographic database, the profile server outputting a demographic profile or a demographic profile key for each computer identification code listed in the demographic database;
- e) a marketing segment database coupled to the first server storing at least two pre-selected market segments;
- f) a decision engine coupled to the first server configured to read at least one identification code residing on the visitor's computer, the decision engine accessing the demographic database to determine a set of demographic attributes for the visitor, said decision engine selecting one of said at least two market segments as a function of said set of demographic attributes of the visitor and outputting a corresponding market segment code; and
- g) a second HTTP command path link configured to form a path from the visitor's browser to one of the files coupled to said first server as a function of said market segment code.

8. The system of Claim 7, further including at least one 1-pixel gif image file link configured to report click-stream data to said first server.

9. The system of Claim 8, wherein said click-stream data includes purchase instance data.

10. A method of determining an appropriate market segment for a visitor to a web-site, comprising the steps of:

- a) forming at least two market segments having different demographic attributes;
- b) reading an identification code residing on the visitor's computer;
- b) accessing a database of demographic records to determine at least one demographic profile for the identification code; and
- e) selecting one of the market segments for the visitor as a function of said at least one demographic profile.

11. The method of Claim 10, wherein said step of selecting one of the market segments is performed using a lookup table.

12. The method of Claim 10, wherein said step of selecting one of the market segments is a function of a set of rules.

13. The method of Claim 10, wherein said step of selecting one of the market segments is based upon a tree search.

14. The method of Claim 10, further comprising the step of delivering custom content to the visitor as a function of the selected market segment.

15. The method of Claim 10 wherein there is a separate set of custom content for each market segment.

16. The method of Claim 10 further comprising the step of recording a log of the visitor's response to the custom content.

17. A method of providing custom content from a web server having categories of custom content to be delivered to a visitor to a web-site based upon demographic attributes of the visitor, the method comprising the steps of:

- a) receiving an identification code stored on the computer of the visitor;

b) delivering custom content to a browser of the visitor as a function of a demographic profile associated with the identification code of the visitor.

18. The method of Claim 17, further comprising the step of recording click stream data from the visitor's computer as the user browses the custom content delivered to the visitor.

19. A method of providing custom content from a client web server, the method comprising the steps of:

- a) selecting at least two market segments having different demographic attributes;
- b) creating for each market segment at least one market-specific web page having attributes specific to said market segment and storing said web pages in a first database coupled to said client web server;
- c) reading an identification code stored on the computer of a visitor to a web site linked to the client web server;
- d) accessing a database of demographic records and assigning a demographic profile to the visitor based upon said identification code;
- g) selecting one of the market segments as a function of the demographic profile;
- h) downloading on the visitor's web browser the market-specific web page appropriate for the market segment of the visitor; and
- i) recording a visitor's log entry as the visitor browses said market-specific web page, said log entry including click stream and purchase instance data.

20. A method of electronic commerce using a host web server to form a central database of consumer profile and purchasing behavior instance data, the method comprising the steps of:

- a) coupling the client servers of at least two websites to the host web server;
- b) selecting for each of the web sites at least two market segments having different demographic attributes;
- c) creating for each market segment at least one market-specific web page having attributes specific to said market segment;

- d) reading an identification code stored on the computer of each visitor to one of the web sites;
- e) accessing a database to acquire profile data for each visitor;
- f) selecting one of the market segments for each visitor as a function of said profile data;
- g) downloading on the visitor's web browser the market-specific web page appropriate for the market segment of the visitor; and
- h) recording a visitor's log entry of clickstream data for each visitor as the visitor browses the market-specific web page.

21. A method of forming a data warehouse for use in the electronic commerce of related industries, the method comprising the steps of:

- a) providing a decision engine coupled to a plurality of client servers by a web hosting server, the decision engine coupled to a profile module and market profile module, wherein the decision engine determines an appropriate market segment for displaying custom content to each visitor logging onto the client servers, said decision engine reading an identification code stored on the visitor's computer and selecting an appropriate market segment for each visitor based upon the demographic profile associated with the visitor;
- b) recording click stream and purchase instance data for each visitor browsing the web pages of said plurality of client servers; and
- c) forming a database containing visitor profiles and associated click stream and purchase instance data for visitors from said plurality of client servers.

22. A method of forming a demographic profile for visitors to a web-site, the method comprising the steps of:

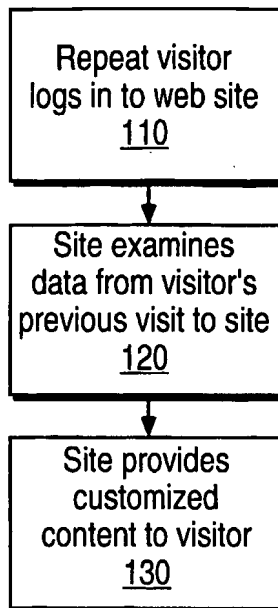
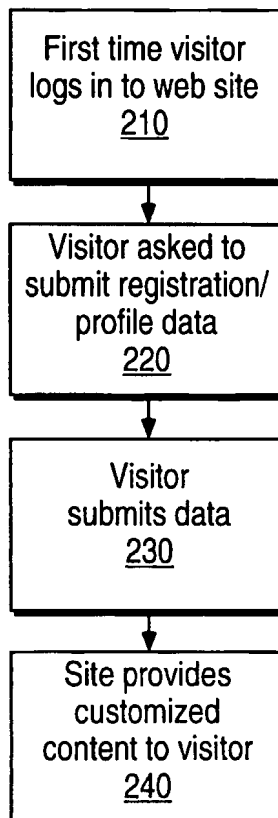
- a) acquiring a first set of profile data having a first set of demographic data attributes for a first set of computers;
- b) acquiring a second set of profile data having a second set of demographic data attributes for a second set of computers; and
- c) forming a superset of profile data by statistically combining said first and said second set of profile data to have a common set of demographic data attributes for a computer listed in both said first set and said second set of computers.

23. The method of Claim 22, wherein said first and second set of demographic data is cookie data and at least one cookie identification code is read from the visitor's computer to identify a computer common to said first and second set of computers.

24. A method of delivering web pages having custom content to a visitor to a web-site, the method comprising the steps of:

- a) reading the internet protocol address of the visitor;
- b) comparing the Internet protocol address of the visitor to a database of Internet protocol addresses, the database having an index of geographic locations associated with a plurality of Internet protocol addresses;
- c) selecting a geographic region for the visitor within which the geographic location of the visitor's internet protocol address resides; and
- d) serving custom content to a browser of the visitor as a function of the geographic location of the visitor.

1/14

FIG. 1
(Prior Art)FIG. 2
(Prior Art)

2/14

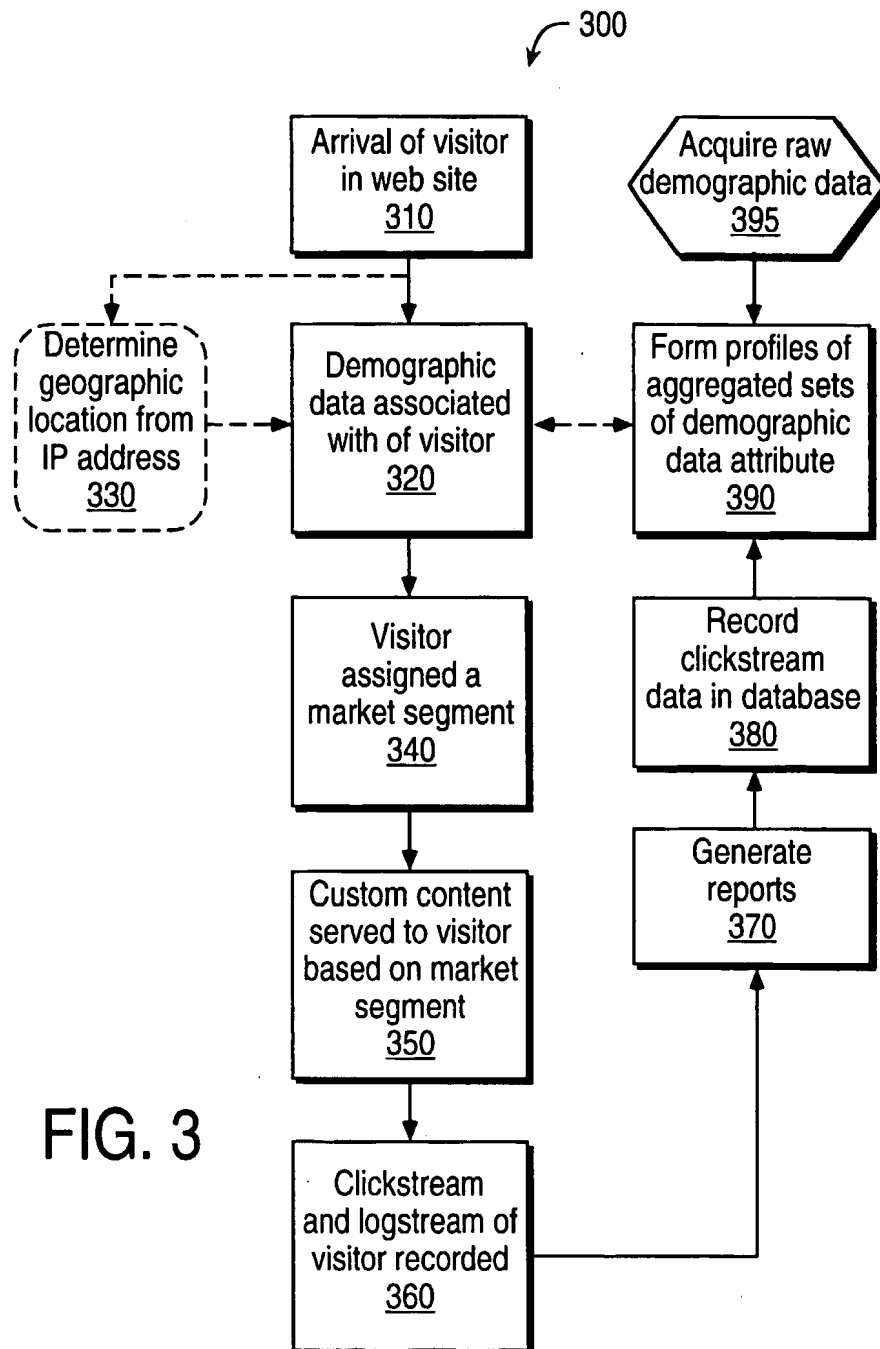


FIG. 3

3/14

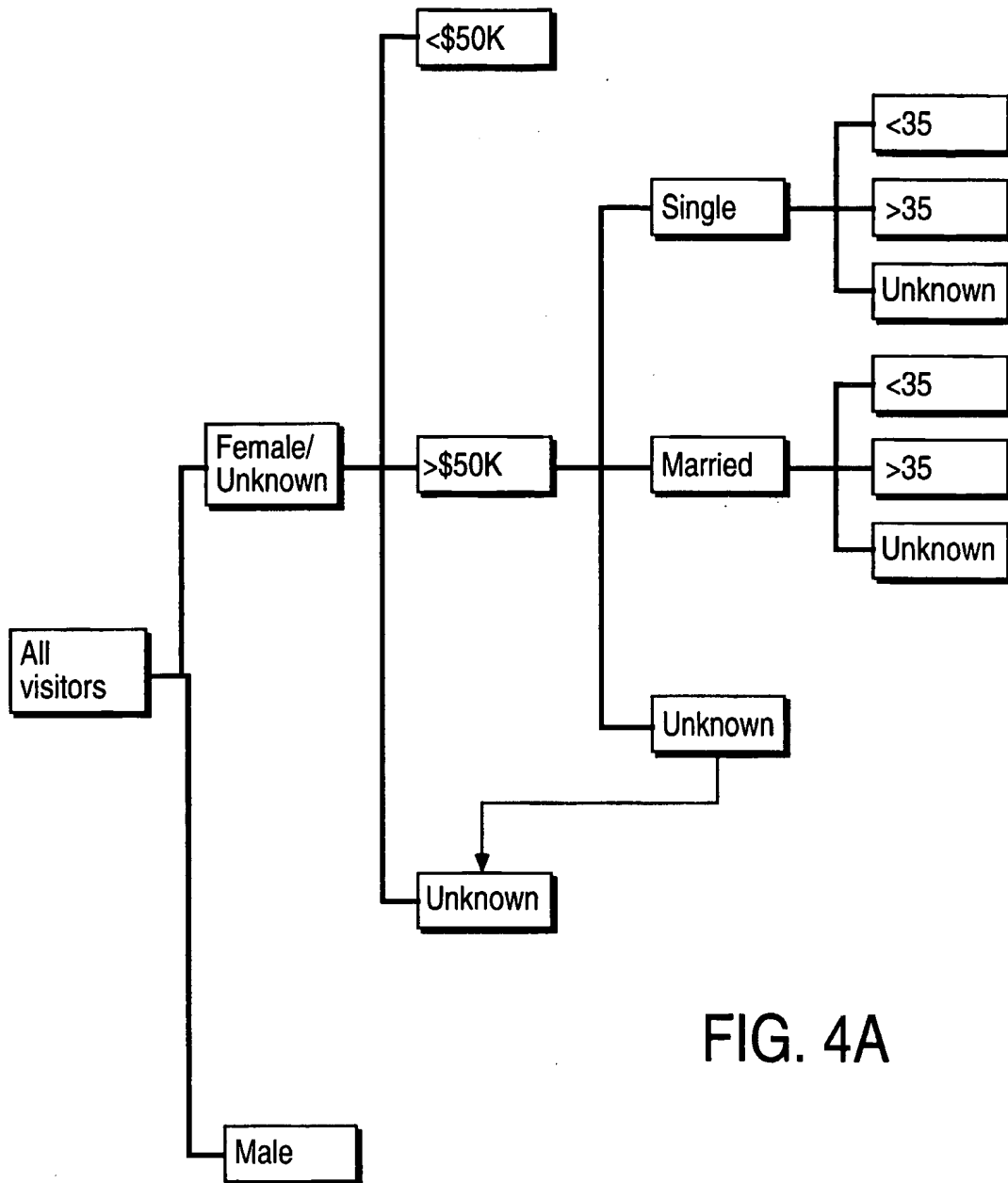


FIG. 4A

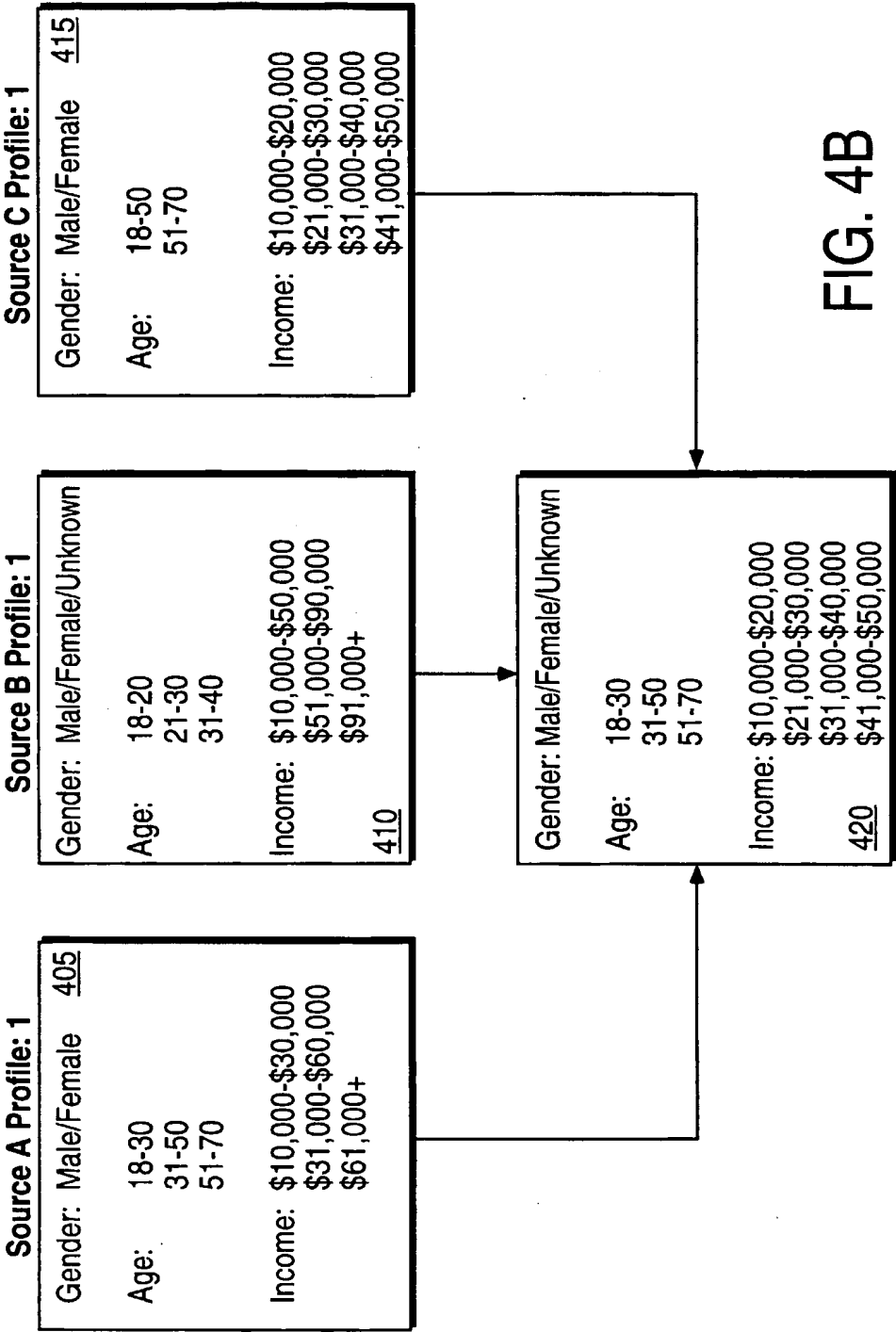
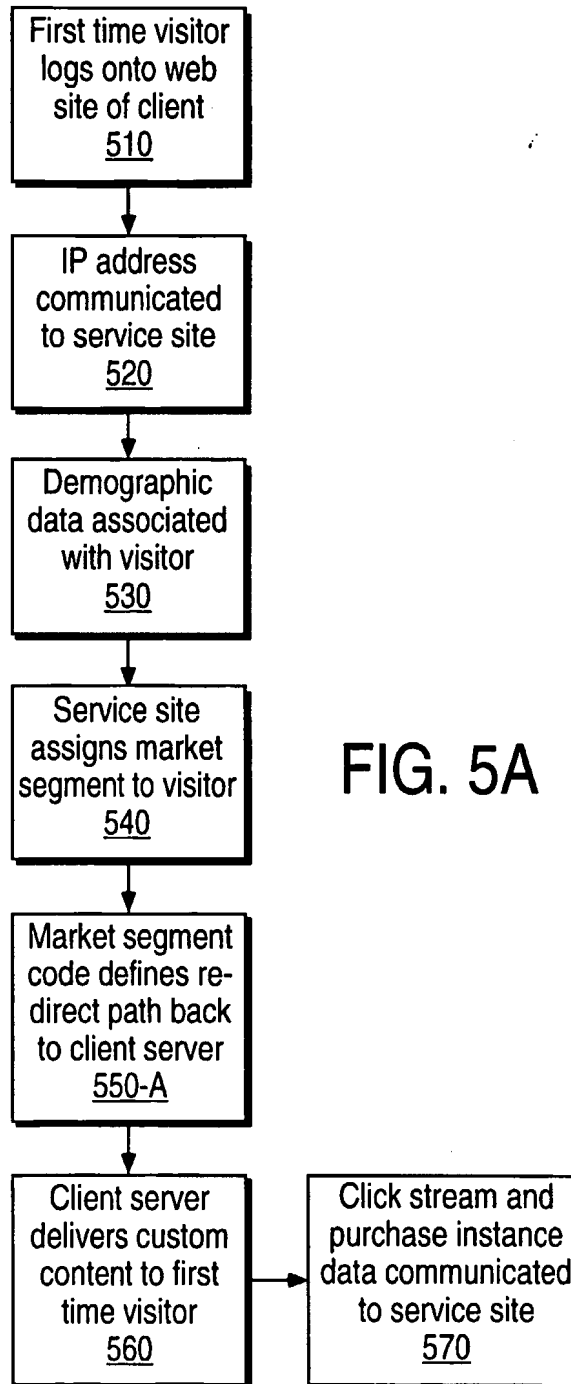
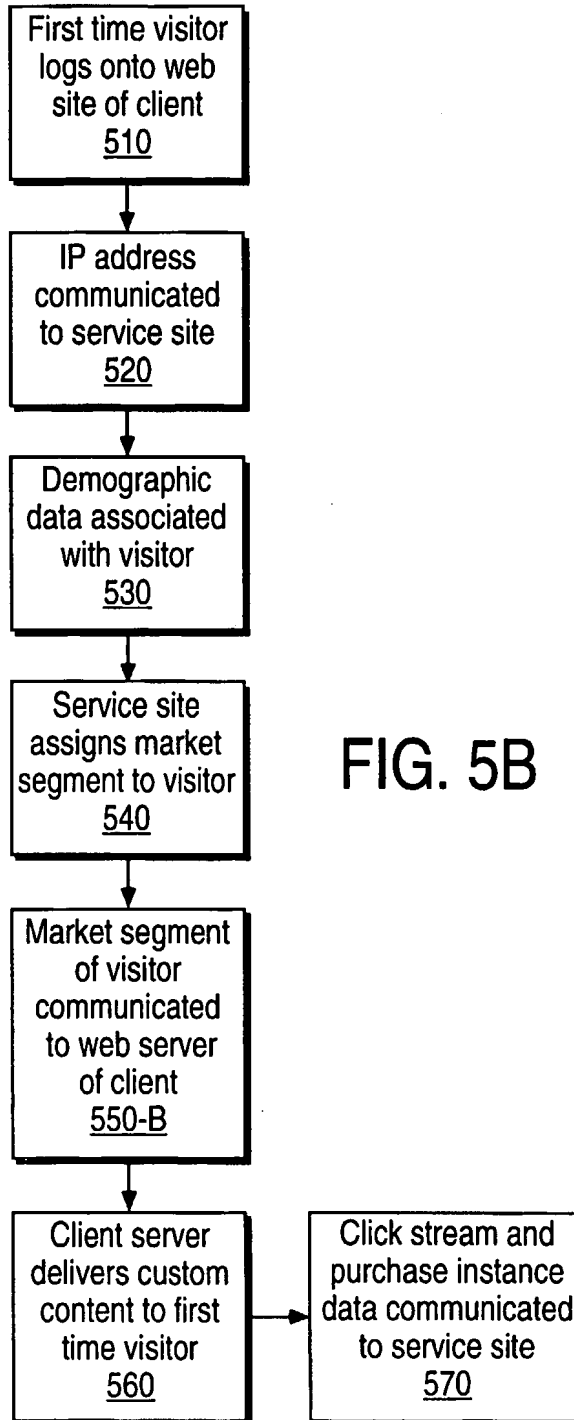


FIG. 4B

5/14



6/14



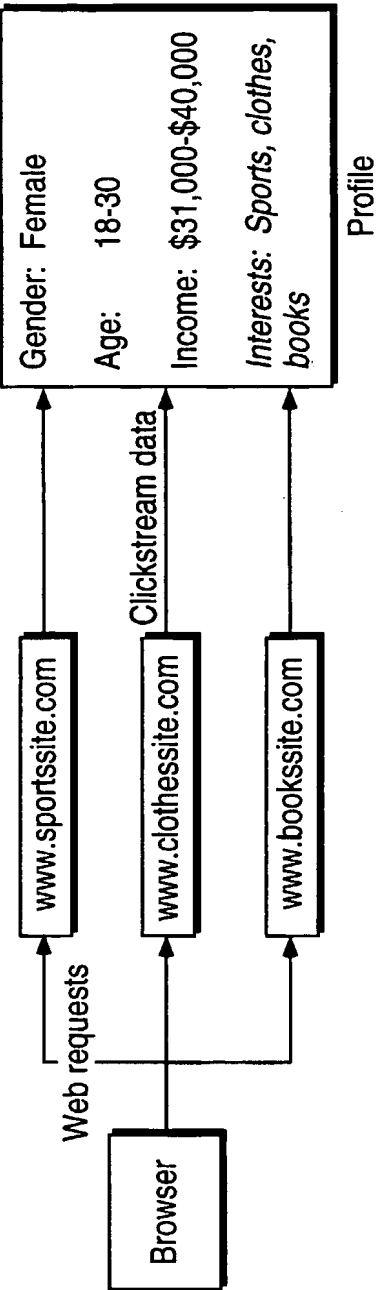


FIG. 6

8/14

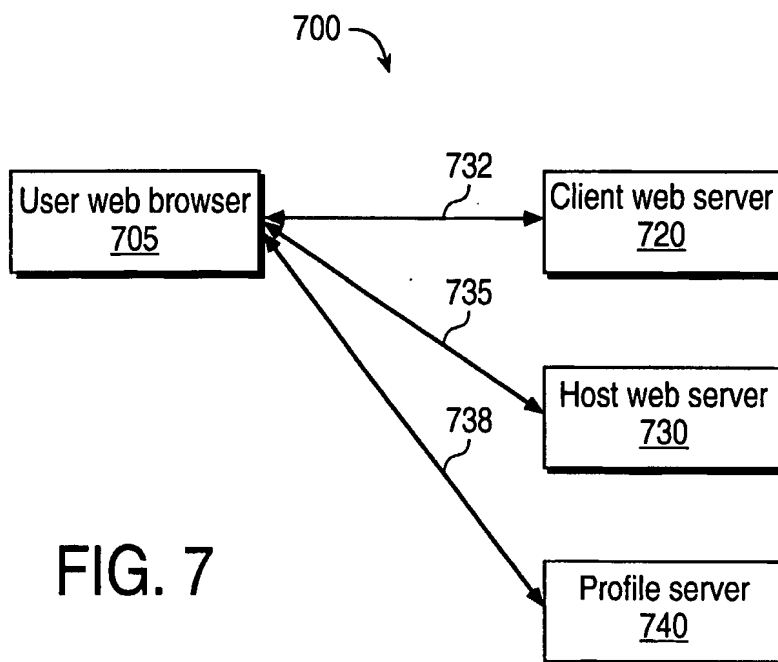


FIG. 7

9/14

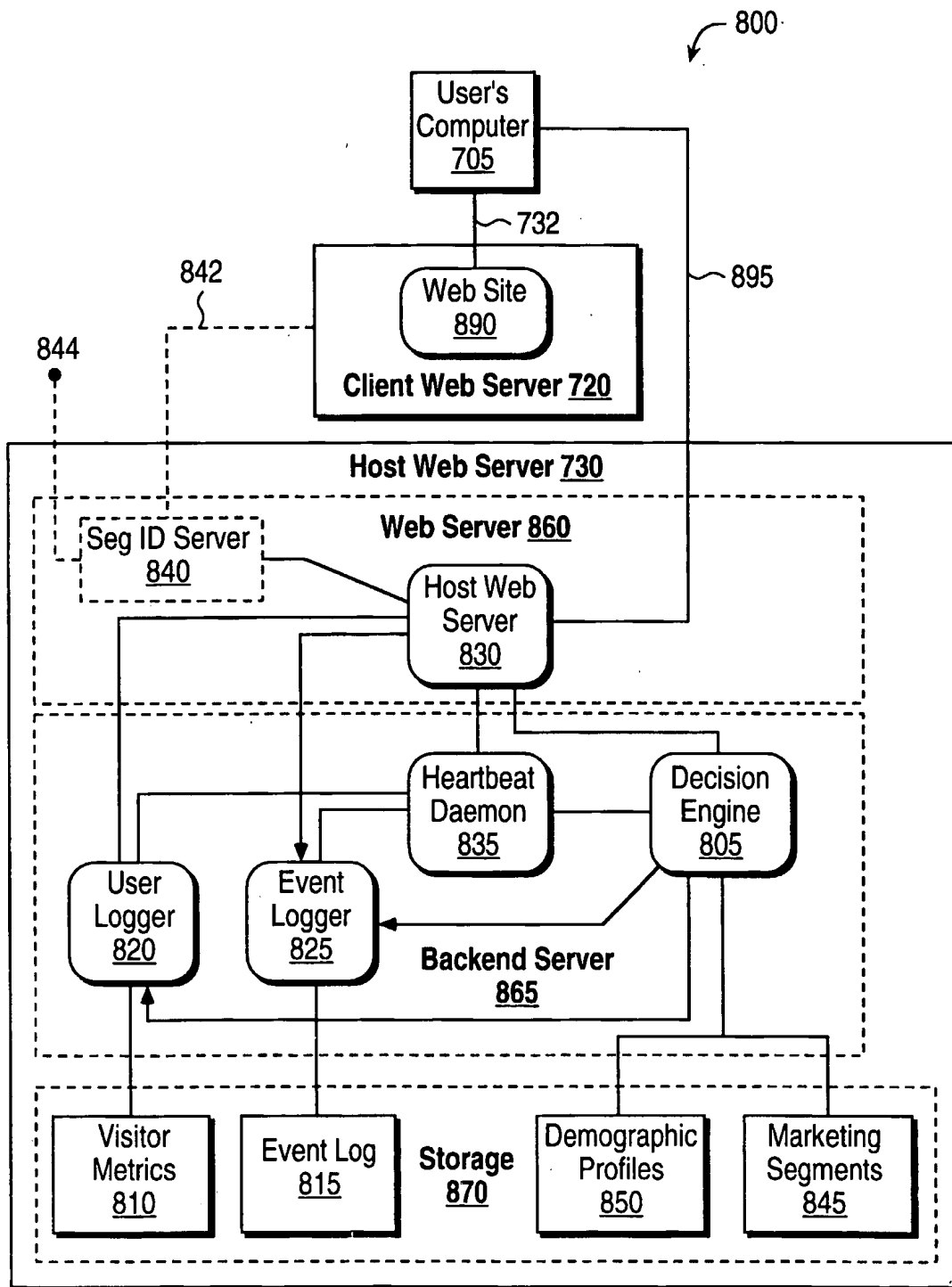


FIG. 8

10/14

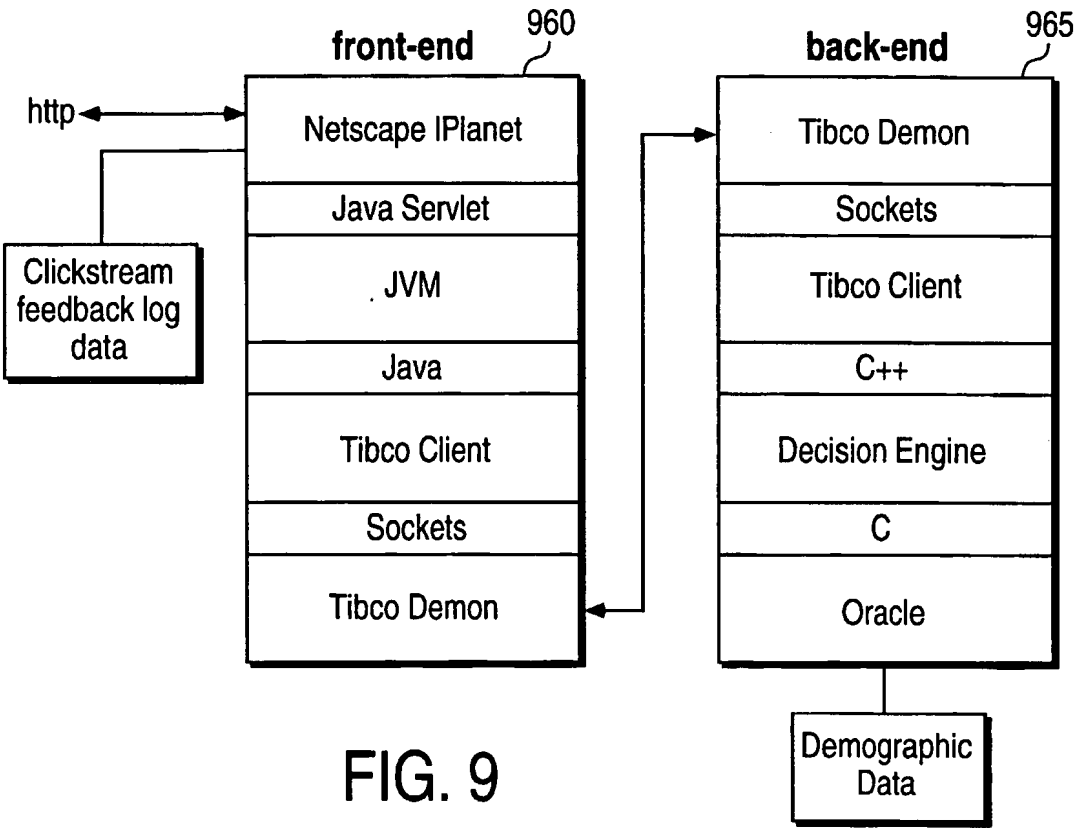


FIG. 9

11/14

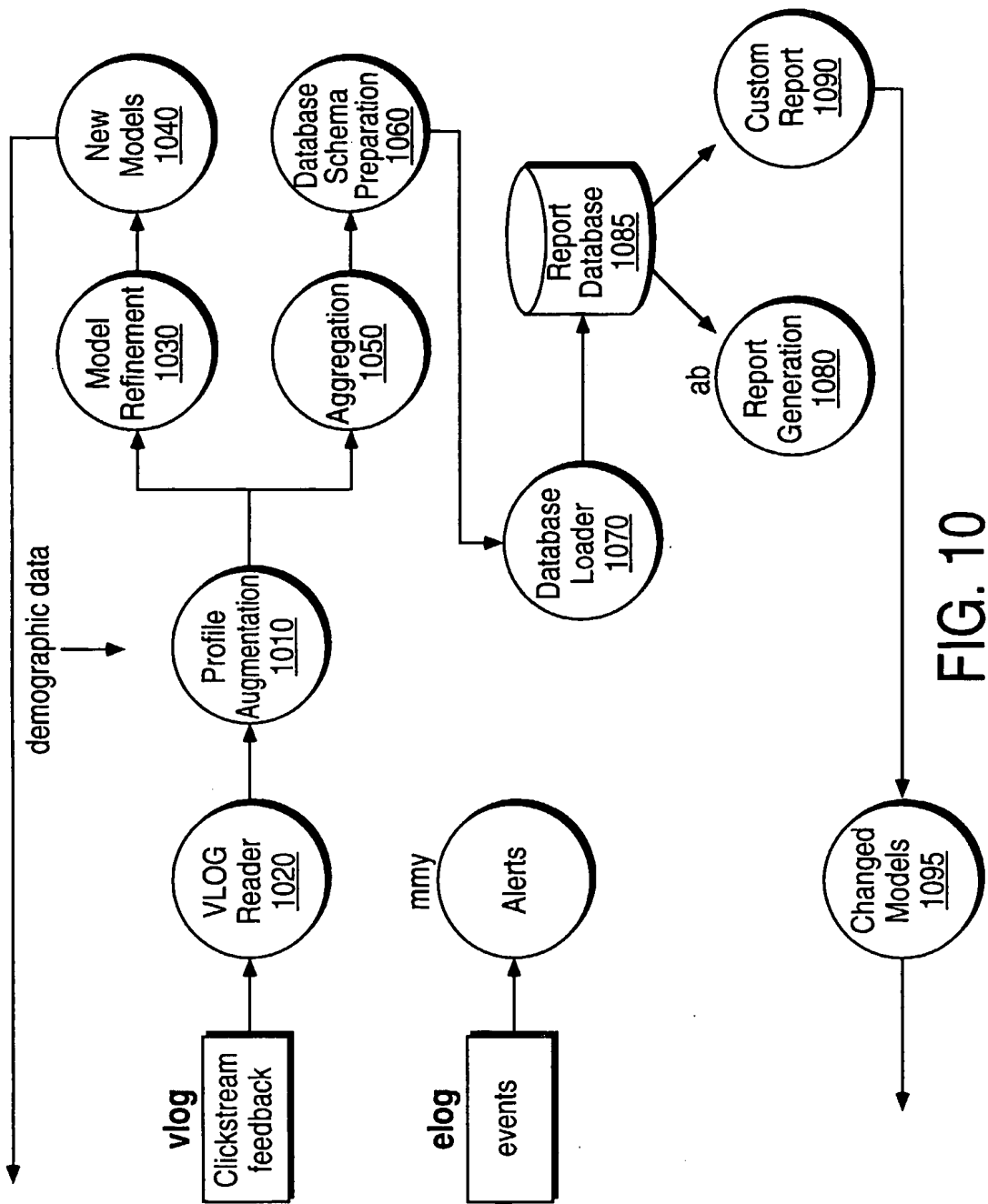


FIG. 10

12/14

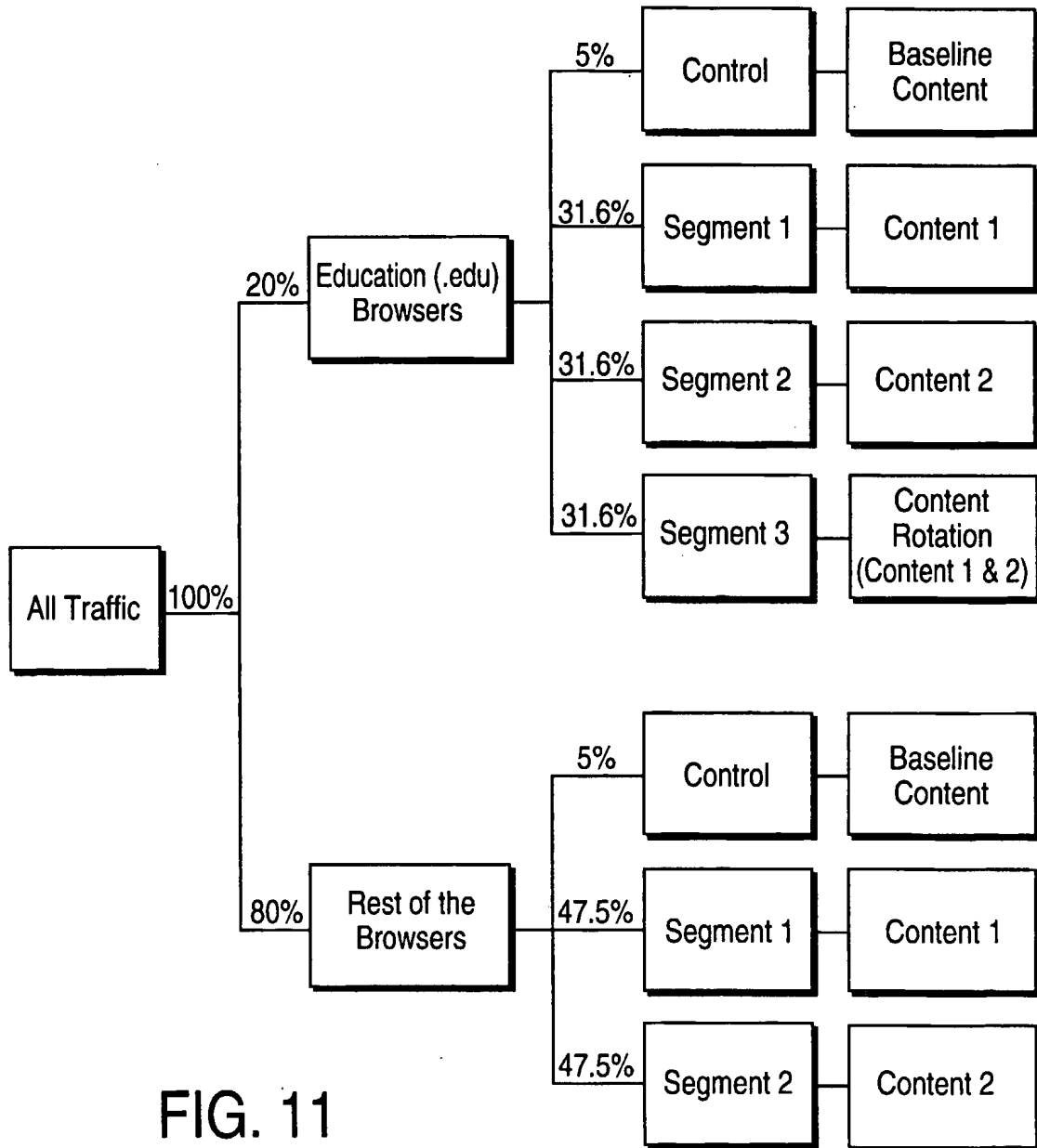


FIG. 11

13/14

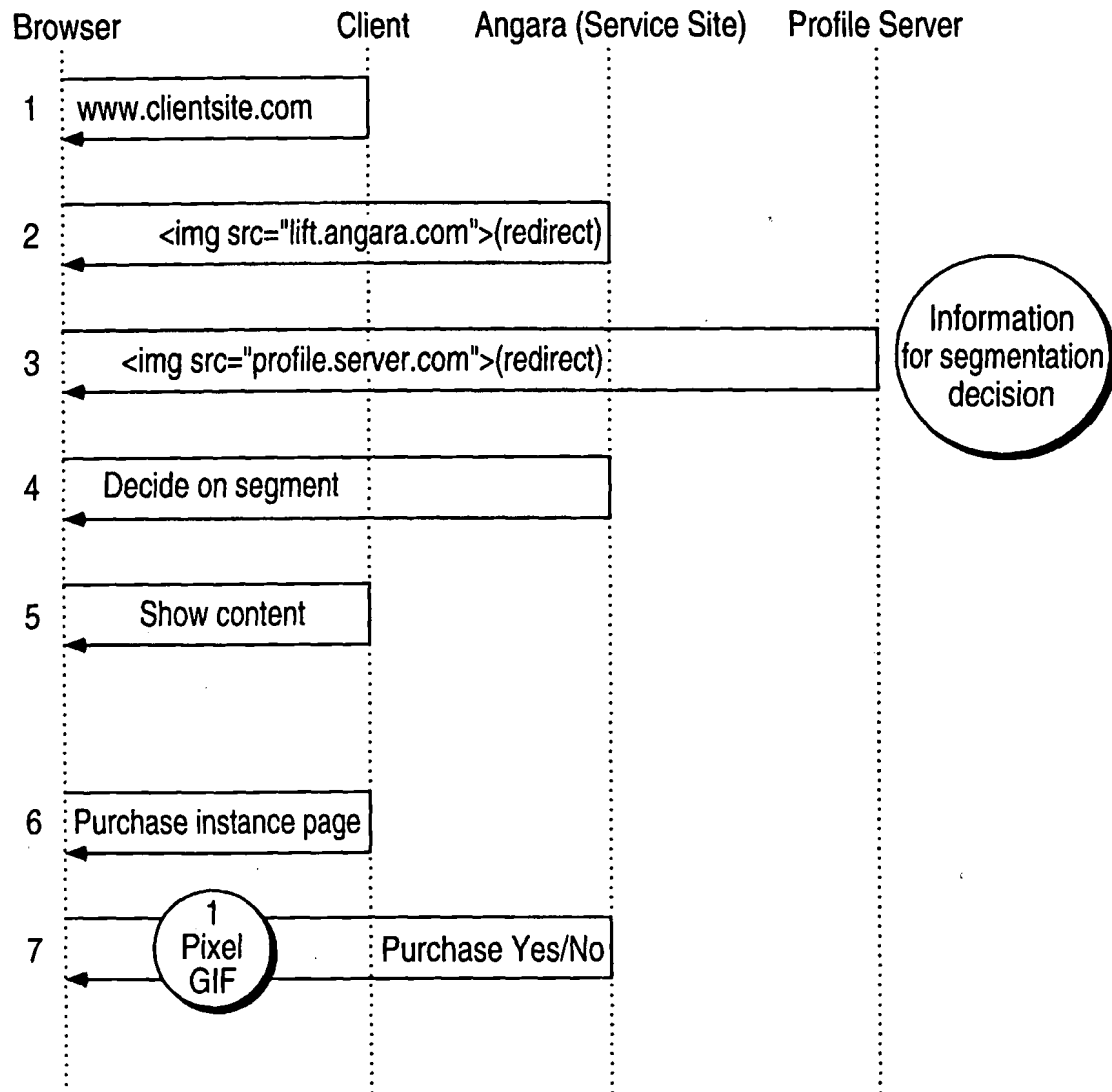


FIG. 12A

14/14

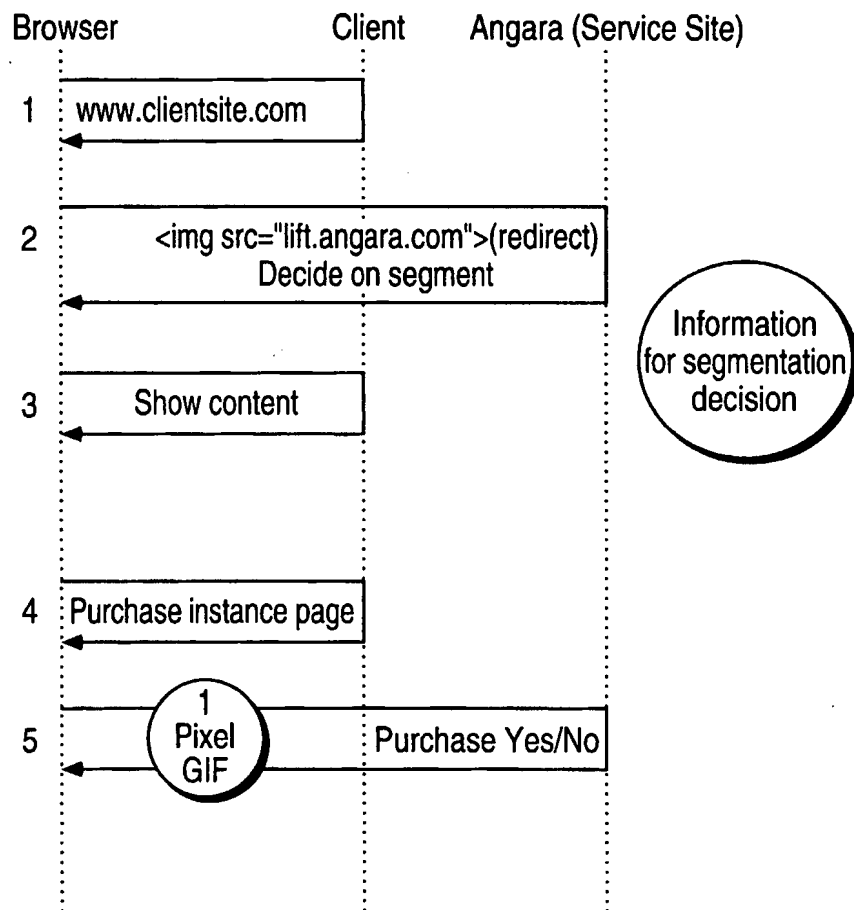


FIG. 12B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/01862

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 17/60

US CL : 705/1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/1, 14, 26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,968,125 A (GARRICK et al) 19 October 1999 (19.10.1999), See entire document	1-24
Y	US 6,014,638 A (BURGE et al) 11 January 2000, (11.01.2000), See entire document	1-24
Y	US 5,933,811 A (ANGLES et al) 03 August 1999 (03.08.1999), See entire document	1-24
Y	US 5,991,735 A (GERACE) 23 November 1999 (23.11.1999), See entire document	1-24
Y	US 6,009,410 A (LEMOLE et al) 28 December 1999 (28.12.1999), See entire document	1-24
A	US 5,996,007 A (KLUG et al) 30 November 1999 (30.11.1999), See entire document	1-24
Y,P	US 6,038,598 A (DANNEELS) 14 March 2000 (14.03.2000), See entire document	1-24
Y,E	US 6,182,050 B1 (BALLARD) 30 January 2001 (30.01.2001), See entire document	1-24
Y,P	US 6,144,944 A (KURTZMAN, II et al) 07 November 2000 (07.11.2000), See entire document	1-24
Y,P	US 6,112,192 A (CAPEK) 29 August 2000 (29.08.2000), See entire document	1-24
Y,P	US 6,061,658 A (CHOU et al) 09 May 2000 (09.05.2000), See entire document	1, 7, 10, 19-21

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 28 February 2001 (28.02.2001)	Date of mailing of the international search report 20 APR 2001
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